cipitation, and this deficit is pronounced throughout Ontario, Quebec and the Maritime Provinces, where the total fall for the month was in many places a half or even less than a half of the average amount.

With reference to the quantity of snow and ice on the ground at the end of the month, Mr. Stupart says:

Snow has almost entirely disappeared from low levels in British Columbia, and the general weather is reported as spring-like. In the Northwest Territories, Edmonton reports 16 inches of snow on the ground, Battleford 12 inches, and Prince Albert 5 inches, while Medicine Hat and Swift Current only record a "trace." Ice appears to be from 10 to 18 inches in thickness. In Manitoba, Minnedosa records 12 inches of snow on the ground, and Winnipeg 3 inches, but this amount was materially increased during the heavy snowfall of the 1st of January. In northern Ontario and in Quebec a few inches of snow covered the ground at the end of the month, but this disappeared during the first few days of January owing to the mild weather and heavy rains, and what little ice there is left on the rivers and lakes is very thin.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 1, 2, 19, 20. Colorado. 13, 24. Connecticut, 11, 15, 16. Delaware, 15, 16, 18. District of Columbia, 15, 18. Georgia, 1, 2, 18. Idaho, 2, 4, 5, 12, 26, 27, 30. Illinois, 6, 17, 25. Indiana, 14, 15, 17, 20, 22. Iowa, 5, 6, 8. Kansas, 7, 20, 21, 26. Kentucky, 15. Louisiana, 1, 2, 20. Maine, 4, 6, 9. Maryland, 15, 18, 23, 30. Massachusetts, 31. Michigan, 4 to 10, 17, 18, 31. Minnesota, 4, 5, 6, 9, 12, 14, 15, 17, 28, 31. Mississippi, 1, 2. Missouri, 8, 13, 17, 18, 19, 23. Montana, 11, 29, 30. Nebraska, 6, 14, 15, 27. Nevada, 5, 12, 25, 27, 29, 30, 31. New Hampshire, 8, 9, 10. New Jersey, 15. New Mexico, 29. New York, 6, 9, 10, 15. North Carolina, 1, 2, 3. North Dakota, 4, 12, 14, 16, 23, 31. Ohio, 4, 14, 15, 16. Oregon, 1, 12. Pennsylvania, 15. South Carolina, 1, 2, 3. South Dakota, 4, 5, 13, 14, 16, 19. Tennessee, 14, 18. Texas, 1. Utah, 13, 29. Vermont, 7, 10. Virginia, 8, 15 to 18. Washington, 1, 2, 4, 7, 9 to 14, 19, 29, 31. West Virginia, 15. Wisconsin, 4, 5, 8, 17.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 14, 15. New Mexico, 29, 30. Oregon, 30, 31. Tennessee, 14. Texas, 31.

WIND.

The *prevailing winds* for December, 1896, viz, those that were recorded most frequently, are shown in Table I for the regular Weather Bureau stations.

HIGH WINDS.

Maximum wind velocities of 50 miles or more per hour were reported during this month at regular stations of the Weather Bureau as follows (maximum velocities are averages for five minutes; extreme velocities are gusts of shorter duration, and are not given in this table):

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				*Miles*	
Block Island, R. I	15	72	ne.	Helena, Mont	4	50	sw.
Do	16	80	ne.	Kittyhawk, N. C	15	54	n.
Do	17	54	ne.	Do	16	56	n.
Do	23	59	ne.	Nantucket, Mass	15	52	ne.
Buffalo, N. Y	9	56	w.	Do	16	62	ne.
Cheyenne, Wyo	4	56	nw.	Do	17	55	ne.
Eastport, Me	16	56	ne.	New York, N. Y	9	52	sw.
El Paso, Tex	16	58	nw.	Do	16	54	n.
Fort Canby, Wash	3	59	s.	Do	19	51	nw.
Do	6	58	s.	Tatoosh Island, Wash.	3	50	s.
Do	7	58	s.	Do	6	50	s.
Do	9	60	s.	Do	9	54	s.
Do	10	58	s.	Do	13	52	w.
Do	12	72	s.	Do	26	50	ne.
Do	18	52	s.	Woods Hole, Mass	16	54	ne.
Do	29	78	se.	Do	17	50	n.
Hatteras, N. C	2	51	n.	Do	23	52	n.
Do	15	61	nw.	Do	24	50	n.
Do	16	54	nw.				

The *resultant winds*, as deduced from the personal observations made at 8 a. m. and 8 p. m., are given in Table IX. These latter resultants are also shown graphically on Chart IV, where the small figure attached to each arrow shows the number of hours that this resultant prevailed, on the assumption that each of the morning and evening observations represents one hour's duration of a uniform wind of average velocity. These figures indicate the relative extent to which winds from different directions counterbalanced each other.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 19 regular stations of the Weather Bureau by its photographic, and at 32 by its thermal effects. At one of these stations records are kept by both methods. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table XI for each hour of local mean time.

Photographic and thermometric registers give the duration of that intensity of sunshine which suffices to make a record, and, therefore, they generally fail to record for a short time after sunrise and before sunset, because, even in a cloudless sky, the solar rays are then too feeble to affect the self-registers. If, therefore, such records are to be used for determining the amount of cloudiness, they must be supplemented by special observations of the sky near the sun at these times. The duration of clear sky thus specially determined constitutes the so-called twilight correction (more properly a low-sun correction), and when this has been applied, as has been done in preparing Table XI, there results a complete record of the clearness of the sky from sunrise to sunset in the neighborhood of the sun. The twilight correction is not needed when the self-registers are used for ascertaining the duration of a special intensity of sunshine, but is necessary when the duration of cloudiness is alone desired, as is usually the case.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table XI.

COMPARISON OF DURATIONS AND AREAS.

The sunshine registers give the *durations* of effective sunshine whence the duration relative to possible sunshine is derived; the observers' personal estimates give the percentage of *area* of clear sky. These numbers have no necessary relation to each other, since stationary banks of clouds may obscure the sun without covering the sky, but when all clouds have a steady motion past the sun and are uniformly scattered over the sky, the percentages of duration and of area agree closely. For the sake of comparison, these percentages have been brought together, side by side, in the following table, from which it appears that, in general, the instrumental records of percentages of durations of sunshine are almost always larger than the observers' personal estimates of percentages of area of clear sky; the average excess for December, 1896, is 6 per cent for photographic and 6 per cent for thermometric records.

The details are shown in the following table, in which the stations are arranged according to the *total possible* duration of sunshine, and not according to the *observed* duration as in previous years.

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		H'rs.	%	%	%	%	%
Tampa, Fla	T.	322.9	55	.....	.....	55	0
Galveston, Tex	P.	320.2	61	64	+ 3	.....	.....
New Orleans, La	T.	317.8	47	.....	.....	50	+ 3
Savannah, Ga	P.	313.0	63	60	− 3	.....	.....
Vicksburg, Miss	T.	313.0	61	.....	.....	74	+13
Phœnix, Ariz	P.	310.7	73	79	+ 6	.....	.....
San Diego, Cal	P.	310.7	66	78	+12	.....	.....
Atlanta, Ga	T.	307.7	59	.....	.....	57	− 2
Los Angeles, Cal	P.	307.7	65	72	+ 7	.....	.....
Wilmington, N. C	T.	307.7	57	.....	.....	62	+ 5
Chattanooga, Tenn	T.	305.2	51	.....	.....	46	− 5
Little Rock, Ark	T.	305.2	56	.....	.....	74	+18
Raleigh, N. C	T.	302.5	55	.....	.....	64	+ 9
Santa Fe, N. Mex	P.	302.5	64	75	+11	.....	.....
Fresno, Cal	T.	299.4	47	.....	.....	50	+ 3
Dodge City, Kans	P.	296.7	62	66	+ 4	.....	.....
Louisville, Ky	T.	296.7	41	.....	.....	56	+15
San Francisco, Cal	T.	296.7	38	.....	.....	45	+ 7
Baltimore, Md	T.	293.7	34	.....	.....	37	+ 3
Cincinnati, Ohio	T.	293.7	42	.....	.....	38	− 4
Kansas City, Mo	P.	293.7	51	48	− 3	.....	.....
St. Louis, Mo	T.	293.7	42	.....	.....	57	+15
Washington, D. C	P.	293.7	53	61	+ 8	.....	.....
Columbus, Ohio	T.	291.7	30	.....	.....	23	− 7
Denver, Colo	P.	291.7	50	69	+19	.....	.....
Indianapolis, Ind	T.	291.7	36	.....	.....	53	+17
Philadelphia, Pa	T.	291.7	53	.....	.....	70	+17
Cheyenne, Wyo	P.	287.8	47	60	+13	.....	.....
Eureka, Cal	P.	287.8	35	28	− 7	.....	.....
New York, N. Y	T.	287.8	51	.....	.....	65	+14
Omaha, Nebr	P.	287.8	45	.....	.....	.....	.....
Salt Lake City, Utah	P.	287.8	27	51	+24	.....	.....
Binghamton, N. Y	T.	284.7	26	.....	.....	29	+ 3
Boston, Mass	T.	284.7	50	.....	.....	64	−14
Chicago, Ill	T.	284.7	28	.....	.....	38	0
Cleveland, Ohio	T.	284.7	22	.....	.....	.....	.....
Des Moines, Iowa	T.	284.7	45	.....	.....	48	+ 3
Detroit, Mich	T.	284.7	27	.....	.....	34	+ 7
Dubuque, Iowa	T.	284.7	26	.....	.....	25	− 1
Albany, N. Y	T.	281.0	37	.....	.....	59	+22
Buffalo, N. Y	T.	281.0	15	.....	.....	16	+ 1
Rochester, N. Y	T.	281.0	19	.....	.....	21	+ 2
Northfield, Vt	P.	277.7	38	41	+ 3	.....	.....
Portland, Me	T.	277.7	48	.....	.....	62	+14
Eastport, Me	P.	274.3	42	53	+11	.....	.....
Minneapolis, Minn	T.	274.3	.....	.....	.....	26	.....
Portland, Oreg.*	T.	269.6	21	.....	.....	13	− 8
	P.	269.6	21	10	−11	.....	.....
Bismarck, N. Dak	P.	265.6	45	47	+ 2	.....	.....
Helena, Mont	P.	265.6	35	39	+ 4	.....	.....
Seattle, Wash	T.	262.1	16	.....	.....	13	− 3

Owing to an inexplicable accident the table of differences, published on page 110 of the REVIEW for April, was seriously disarranged, and the reader is requested to substitute the following in its place:

Difference between instrumental and personal observations of sunshine.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine			
				Photographic.	Difference.	Thermometric.	Difference.
		Hours.	%	%	%	%	%
Bismarck, N. Dak	P.	408.4	38	42	+ 4	.....	.....
Helena, Mont	P.	408.4	52	54	+ 2	.....	.....
Portland, Oreg.*	T.	407.0	37	.....	.....	30	− 7
	P.	407.0	37	30	− 7	.....	.....
Eastport, Me	P.	405.2	44	54	+10	.....	.....
Northfield, Vt	P.	403.6	45	54	+ 9	.....	.....
Portland, Me	T.	403.6	40	.....	.....	59	+19
Rochester, N. Y	T.	402.1	55	.....	.....	68	+13
Buffalo, N. Y. †	T.	402.1	37	.....	.....	51	+14
Boston, Mass	T.	401.1	53	.....	.....	61	+ 8
Chicago, Ill	T.	401.1	54	.....	.....	63	+ 9
Cleveland, Ohio	P.	401.1	43	57	+14	.....	.....
Des Moines, Iowa	T.	401.1	39	.....	.....	65	+26

Difference between instrumental and personal observations.—Cont'd.

Stations.	Apparatus.	Total possible duration for the whole month.	Personal estimated area of clear sky.	Instrumental record of sunshine.			
				Photographic.	Difference.	Thermometric.	Difference.
		H'rs.	%	%	%	%	%
Detroit, Mich	T.	401.1	52	.....	.....	62	+10
Eureka, Cal	P.	399.4	34	38	+ 4	.....	.....
New York, N. Y	T.	399.4	49	.....	.....	57	+ 8
Salt Lake City, Utah	P.	399.4	28	56	+28	.....	.....
Columbus, Ohio	T.	398.6	45	.....	.....	62	+17
Denver, Colo	P.	398.6	56	76	+20	.....	.....
Philadelphia, Pa	T.	398.6	47	.....	.....	71	+24
Baltimore, Md	T.	397.0	46	.....	.....	47	+ 1
Cincinnati, Ohio	T.	397.0	56	.....	.....	79	+23
Kansas City, Mo	P.	397.0	45	50	+ 5	.....	.....
St. Louis, Mo	T.	397.0	53	.....	.....	72	+19
Washington, D. C	P.	397.0	59	55	− 4	.....	.....
Dodge City, Kans	P.	396.2	60	68	+ 8	.....	.....
Louisville, Ky	T.	396.2	55	.....	.....	81	+26
San Francisco, Cal	T.	396.2	44	.....	.....	62	+18
Santa Fe, N. Mex	P.	393.6	68	84	+16	.....	.....
Little Rock, Ark	T.	392.7	37	.....	.....	73	+36
Atlanta, Ga	T.	391.6	59	.....	.....	79	+20
Wilmington, N. C	T.	391.6	69	.....	.....	83	+14
San Diego, Cal	P.	390.5	78	84	+ 6	.....	.....
Phœnix, Ariz	P.	390.5	80	91	+11	.....	.....
Savannah, Ga	P.	389.9	59	72	+13	.....	.....
Vicksburg, Miss	T.	389.9	67	.....	.....	67	0
New Orleans, La	T.	387.4	48	.....	.....	50	+ 2
Galveston, Tex	P.	386.4	35	44	+ 9	.....	.....

* Records by both methods.

† Instrumental records for only twenty-one days, for which the total possible was 285.9.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table X, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which reports of thunderstorms for the whole country were most numerous were: 14th, 49; 30th, 39.

Thunderstorm reports were most numerous in: Louisiana, 17; New Mexico, 13; Tennessee, 14.

Thunderstorms were most frequent in: Idaho and Texas, 4 days; Louisiana, 7.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 15th to the 23d, inclusive. On the remaining twenty-two days of this month 277 reports were received, or an average of about 13 per day. The dates on which the number of reports especially exceeded this average were: 3d, 183; 4th, 23.

Auroras were reported most frequently in: Michigan, 7 days; Montana, 9; New York, 8; Ohio, 11.

The number of reports was a large percentage of the number of observers in: Maryland, 45; North Dakota, 36; Massachusetts, 32; New York, 30; Nebraska, 22.

CANADIAN REPORTS.

A thunderstorm was reported at Edmonton on the 21st.

Auroras were reported as follows: Halifax, 27th; Grand Manan, 3d; Yarmouth, 3d; St. Andrews, 4th; Charlottetown, 3d; Father Point, 5th; Quebec, 1st; Montreal, 3d; Toronto, 3d; White River, 3d, 13th; Ottawa, 3d; Port Stanley, 13th; Winnipeg, 27th; Minnedosa, 1st, 3d, 6th to 9th; Medicine Hat, 11th, 12th; Calgary, 4th, 5th; Prince Albert, 5th, 12th; Battleford, 13th, 14th.